CHEM-BIO DEFENSE

Quarterly

Vol. 2 No. 3

No More Barking:
Command Sgt. Maj. Makes History in the Chemical Corps

A New Focus for Biological Defense Technology

Network Centric Warfare: Superiority Achieved through Superior Situational Awareness

Cover photo by:
Staff Sgt. Bennie J. Davis III
ANDERSEN AIR FORCE BASE, Guam – Airman 1st Class Nathan Fitzwater conceals himself by camouflaging in palm leaves and face paint during the first Enlisted Combat Dining In here Jan. 29.

Back cover photos by:
Steve Lusher, Camber – The Portable Area Warning and Surveillance System displayed at the Pentagon and on Capitol Hill June 9th and 10th, garnered a lot of attention as it was on exhibit during a public demonstration, that provided an understanding of military and first response capabilities.

SPC Jose Perez of 3rd PLT/51st Chemical Company is a driver for 3rd Squad and he manages a Fox Reconnaissance Vehicle in Fort Polk, LA. These Soldiers spend a good amount of time at the carpool, making sure their equipment is in shape and ready for combat. Photo by Steve Lusher (Camber).

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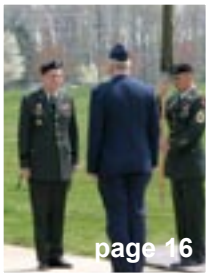
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From the Joint Program Executive Officer

Brigadier General Stephen V. Reeves
Joint Program Executive Officer
for Chemical and Biological Defense

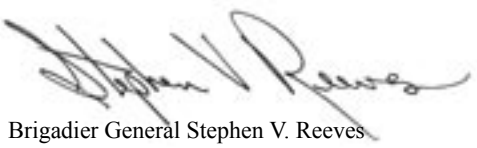
About two years ago, a group of Soldiers deployed in Southwest Asia gave up some of their precious free time to sit down and answer two questions: How is your equipment working and what can we do to make it better? After a brief pause, several Soldiers said, "It would be nice if we could see who was knocking on the back door," referring to when they were inside the Biological Integrated Detection System (BIDS). When the operators are inside the shelter performing their mission, there was no way to see the surrounding area outside the vehicle. That conversation ultimately lead to developing and fielding a day/night imaging system to increase BIDS operators' situational awareness. A simple, but knowledgeable suggestion is sometimes all it takes to make a real operational difference.

In this issue, we talk with warfighters about applying technology to real world problems and providing warfighting capabilities. We spent some time with the 83rd Chemical Battalion, Fort Polk, LA, learning what chemical Soldiers think of their equipment and how it supports the war fight. You'll hear from PFC Oscar Hernandez and PFC Derrick Smith as they describe how the training they received before reporting to the battalion prepared them for real world situations. We also look at how embedded Contractor Logistics Support works and is an integral part of supporting fielded equipment.

Today's warfighter is more technologically advanced and therefore, more technologically challenged. With that in mind, we took a look at today's Network Centric Warfare and Chemical, Biological, Radiological and Nuclear (CBRN) situational awareness, and where we are going in the future.

This quarter we welcome U.S. Air Force Col. Daniel Berry as the newest Joint Project Manager for Biological Defense. A medical doctor as well as a Ph.D, his responsibilities include the centralized management of the biological defense program and focusing on technological innovations that help deter current biological threats.

Finally, my thanks to all the reader's who recently responded to the readership survey published in our magazine. You told us how we are doing and I'm happy to say our approval rating is sky high. I encourage you to not only continue reading our publication, but to continue communicating with our editor. Your article ideas are vital. We want to know what you want to know, what topics inspire your professional interest and improve your professional knowledge.



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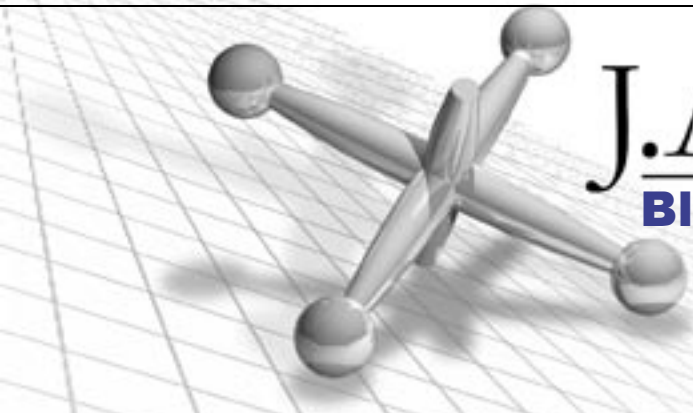


J.A.C.K.S.

Blurring Defense Support Organizational Lines

By Mr. Len Guldenpfennig, Edgewood Chemical Biological Center Information Technology Solutions Team Leader

Historically within the Department of Defense (DoD), information, knowledge and support of Chemical, Biological, Radiological, Nuclear (CBRN) Defense has been organized in a manner parallel to various DoD command structures. This seems logical for various commands and agencies charged with supporting equipment and services within their respective areas of responsibility. However, learning each specific structure (in addition to their CBRN job functions) becomes overwhelming for personnel new to the Armed Services or CBRN defense business. The Joint Program Executive Officer for Chemical and Biological Defense (JPEO-CBD), Brig. Gen. Stephen Reeves, is working to make those organizational boundaries transparent concerning CBRN defense.

Working toward this goal, the JPEO-CBD has established the **J**oint **A**cquisition **C**hemical Biological Radiological Nuclear **K**nowledge **S**ystem (JACKS). The JACKS mission is to provide the warfighting and CBRN defense communities with a single effective and powerful means of accessing CBRN defense information on procedures, material, equipment, availability and acquisition. JACKS is a web-based knowledge management system that provides information for the CBRN defense community, regardless of the agency, equipment manager or data owner.

JACKS does not re-invent the wheel. A key characteristic of JACKS is that it accesses multiple DoD databases and systems, pulling CBRN oriented information into one focused resource to support the CBRN community. This is commonly referred to as a web portal. Within the DoD, there are a high number of CBRN supporting web sites, systems and databases, usually aligned with an organization or office. Many 'unofficial' systems have been created as well and do not receive the maintenance and updating necessary to be a reliable CBRN community resource. To provide accuracy and traceability of data, JACKS has been built to use official System of Record data sources. Currently the Federal Logistics Information System is accessed to periodically update information on more than 100,000 National Stock Numbers (NSN). The DoD Demilitarization Program database is the source for demilitarization code "F" instructions that JACKS uses. Efforts are in process to connect to the Hazardous Materiel Information and Reporting System as the authoritative source of Materiel Safety Data Sheets concerning CBRN defense equipment. An archive of CBRN oriented advisory messages is being created for JACKS. Multiple Maintenance, Logistical, Supply, Safety of Use and other advisory messages are included in the archive, regardless of the agency or command that originated the message. Basically, if it is CBRN oriented and targeted to the DoD community, the message will get archived into JACKS.

https://jacks.jpeocbd.osd.mil

JACKS serves as the System of Record in various CBRN functional areas. The most prominent is the CBRN Shelf Life Information System. The purpose of this system is to host and display CBRN Shelf Life expiration, extension and condemnation information by NSN and Lot Number, as well as other required surveillance information. CBRN Shelf Life extending and condemning actions are the responsibility of the technical expert engineering agencies that have the authority to make such decisions. The U.S. Army's Chemical Material Stockpile Reliability Program (Army Regulation 702-16) Surveillance Team updates Shelf Life information directly in JACKS for instant availability to the CBRN defense community. Other agencies provide background database connections or data feeds to maintain data, and may change their Standard Operating Procedures to make Shelf Life updates directly in JACKS. Regardless of the agency that is responsible for data, it is available in JACKS for Service persons and other consumers to use at their discretion.

JACKS is a CBRN defense system with information considered sensitive but unclassified in nature. The system is accessible to all DoD personnel with a Public Key Infrastructure digital identity certificate. This is usually associated with a Common Access Card (CAC), and that means JACKS is accessible to more than 90% of DoD's military and civilian personnel as of April 2005. Functions within JACKS are access controlled, and this is managed via permissions based on the user's identity certificate. An example would be the CBRN Shelf Life update area. The engineers log into the same JACKS website that all users access. However, since they are identified as members of the technical community and been given additional permissions, they have additional links and options in JACKS that provide access to the Shelf Life update forms.

JACKS is an evolutionary system that is constantly being improved and enhanced. The capabilities and functions are expanding based on user feedback and CBRN community information requirements. Points of contact for recommendations, suggestions and questions can be accessed on JACKS.

JACKS can be accessed at: *https://jacks.jpeocbd.osd.mil*. Users are encouraged to submit suggestions for improvement to JACKS. Together, we can achieve the JPEO-CBD goals of focusing less on organizational structure and more on supporting the CBRN defense community and our warfighters.

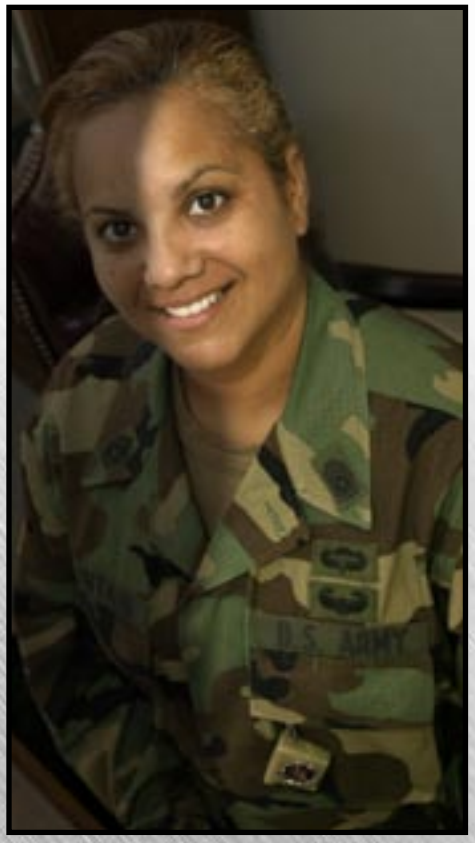
NO MORE BARKING

Command Sgt. Maj. Makes History in the Chemical Corps

Story by Julius L. Evans
Photos by Steve Lusher

In American society, when someone accomplishes a feat or task that hasn't been achieved before, the world embraces that person as a success and recognizes him or her as having reached the top of their field. It took centuries before Roger Bannister came along and broke track and field's most notorious barrier, but he was the first person to run a mile in under four minutes. Condoleezza Rice, in 2001, became the first woman to serve as National Security Advisor. In 1944, Samuel L. Gravely became the first African American commissioned as an officer from the Navy Reserve Officer Training Course. There are literally thousands of great 'firsts' in American history. In the U. S. Army Chemical Corps, another one was just achieved.

Command Sgt. Maj. Jackeline S. Fountain, of the 83rd Chemical Battalion, took the reigns of the highest-ranking enlisted position in the command also becoming the first female to ever hold that position in the history of the U. S. Army Chemical Corps. In her capacity as Command Sgt. Maj., she serves as the principal enlisted advisor to the commander, and is responsible for enlisted leadership development, monitoring and mentoring, and the overall well-being of Soldiers in her battalion.



Command Sgt. Maj. Jackeline S. Fountain

The 83rd Chemical Battalion, commanded by Lt. Col. Michael Bolluyt, is stationed at Fort Polk, LA, where its primary mission is to provide the full capability the Chemical Corps has to offer, inclusive of personnel and equipment decontamination, smoke obscuration, Nuclear, Biological and Chemical (NBC) Reconnaissance, and biological surveillance.

Although the face may have changed, the role of the Command Sgt. Maj. and the beliefs, traditions and values of the battalion remain constant. Fountain attests to that.

"They are the first battalion to have a female Command Sgt. Maj., but they have all adapted to this well. This isn't something all that new for me. I'm still conducting Army business," says the 24 year Army veteran. Fountain came from a corps staff and was familiar with the Biological Integrated Detection System (BIDS) because she help field the BIDS Company, 2nd Chemical Battalion. As she assisted with the planning to get them outfitted, she gained tremendous knowledge of their capabilities and what the unit was doing. When she was a 1st Sgt. of 46th Mechanized Smoke Company 2nd Chemical Battalion, she worked with the vehicles, further expanding her knowledge base of the company teams. "So this isn't something overwhelming for me because I have been around the Chemical Corps for a long time."

Not long ago, a traditional Command Sgt. Maj., held the highest esteem and prestige amongst the Soldiers, but was viewed as a tough, combat-worn, cigar smoking, deep-throat-talking Soldier who barked at his troops whenever any of them walked past his door. However Fountain explains her position on the old adage.

"That was then and this is now. It may appear as if I am soft spoken, but we have

Command Sgt. Maj. Fountain says the technical and tactical Army exhibits the intelligent young Soldiers joining the military today.

"So maybe we weren't kicking down doors, but we were on the road exposed to IEDs, just like our male counterparts."

a technical and a tactical Army, so we can accomplish our mission without barking. I can talk with our Soldiers and they understand the intent; they understand the mission. We have Soldiers with college degrees today so we don't have to bark anymore." Fountain expresses. "When I walk into a room, they still say at ease and recognize that I have entered. The esteem aspect is still there and I receive a lot of respect. So things haven't changed with that regard. We still have the same mission at hand."

When discussing the mission at hand, Fountain was very crisp about her Soldiers' job and the way they conduct their business. "There was a particular point during Operation Iraqi Freedom that two vehicles were lost to improvised explosive devices (IED)," she states. An IED is a "homemade" device designed to cause death or injury by using explosives alone or in combination with toxic chemicals, biological toxins, or radiological material.

"That required us to retrograde those vehicles back to the states. Along with that retrograde, we resourced two vehicles to the 12th and 68th Chemical Companies. As far as the BIDS goes, it detects biological or chemical agents that may be used in the battlefield. Although they are pretty much in the rear, the battlefield has changed. Today, we are fighting on an asymmetrical battlefield where there are no boundaries. And we are able to do that job fully and succinctly. So, that's what we bring to the fight. In addition to various other missions that may be assigned, which include security forces, that's how we are being utilized."

Recently the House Armed Services Committee proposed legislation to restrict women in the military from serving in jobs that could put them in direct ground combat. Fountain didn't hesitate to offer an opinion on women's role in the military.

"In the Chemical Corps, 38 percent are women. That's a very high percentage so you can easily see that we don't discriminate. A lot of our platoon leaders are female. In Operation Iraqi Freedom, we had to use the resources available. We did what we had to do. In the asymmetric battlefield, gender doesn't matter," she states. "So maybe we weren't kicking down doors, but we were on the roads exposed to IEDs, just like our male counterparts.

"We have Soldiers today with college degrees so we can accomplish our mission without barking at them."

"Combat is not a linear battlefield, you don't have a front line where you say we're not going to have women cross a certain boundary to keep them out of harm's way, because it's not like that. We're out there doing everything that we possibly need to do. Although so many different positions may be filled by either gender, females provide the majority of the support because their duty locations are limited. Today, our Soldiers have the flexibility to fight on any battlefield, so unless we change the way we fight from an asymmetric to a linear field, they're going to be out there."

That type of flexibility is typical of the Soldiers joining today's Army. They are versatile, intelligent and meet all the requirements to be known as a complete Soldier, according to Fountain. When they report to their unit, they are prepared for their role of the Soldier first and then the Chemical Soldier.

"They can be the basic Soldier. They can run, they can shoot their weapon, they can communicate, then they can get inside one of these vans with all this high-tech equipment and they can operate an entire laboratory. It doesn't get any better than that. To me, the Chemical Soldier is brilliant," she says.

The future looks bright for Fountain as well. In a world of so many significant first accomplishments, she has yet another wicket she intends to pursue. Her eyes are set on becoming the first female regimental Sgt. Maj. in the Chemical Corps.

No one ever won the Tour de France more than a couple of times back-to-back before Lance Armstrong came alone. He now holds six consecutive titles. Fountain is poised to be a back-to-back record setter as well.

'GENERAL' SUPPORT

Fort Polk, LA, is home of the Joint Readiness Training Center and the 83rd Chemical Battalion. Above: Soldiers practice navigating a toxic area in the M93A1 Fox Training Suite, which contains two Fox vehicle shells and allows Soldiers to operate on virtual terrains with simulated hazardous environments. Right: 1st Lt. Jason Poyser takes his crew through the simulation battle scenario.

FOR WARFIGHTERS IS JOB NUMBER ONE

Story by Julius L. Evans *Photos by Steve Lusher*

Ask any martial artist and he will tell you the secret to his trade is the amount of time spent practicing. The definition of practice is; to perform habitually or customarily; to make a habit of, to perform something repeatedly in order to acquire or polish a skill. In the book, *The Art of War*, author Sun Tzu speaks in various chapters about the importance of the preparation both mentally and physically for war. That preparation begins with practice.

For the 83rd Chemical Battalion located in Fort Polk, LA, their art of war was slightly hindered because of circumstances surrounding their training requirements and those of available training facilities. Fort Polk is home to the Joint Readiness Training Center (JRTC) and the location to where every unit en route to Iraq or Afghanistan reports at one point or another for training.

The JRTC provides highly realistic, stressful, joint and combined arms training across the full spectrum of conflict, both current and future. It is one of the Army's three "Dirt" Combat Training Centers resourced to train infantry brigade task forces and their subordinate elements in the Joint Contemporary Operational Environment. With great emphasis on realism, the JRTC provides rotational units with the opportunity to conduct joint operations which emphasize contingency force missions. The training scenarios are based on each participating organization's mission essential tasks list and many of the exercises are mission rehearsals for actual operations the organizations are scheduled to conduct.

PFC Oscar Hernandez and PFC Darrell Smith of the 83rd Chemical Company pause a moment before explaining the features of the Fox Vehicle.

For the 83rd, without the ability to practice their trade, their training schedule was tremendously obstructed. "Our unit is very unique in that it is the only battalion in the entire U. S. Army that has a pure Fox company," explains Lt. Col. Michael Bolluyt, Commander, 83rd Chemical Battalion. The M-93A1 Fox vehicle is the Army's answer that addresses the need for a standardized, dedicated capability to detect, collect, correlate, and disseminate nuclear, biological (including toxins) and chemical (NBC) data. The Fox provides the capability to rapidly and accurately determine the extent and nature of contamination or NBC hazard over a specified area, and the expeditious means to transmit that information to the combatant commander.

"If you are attached to a unit that is going to either Iraq or Afghanistan, then you are coming here. The training is practically back-to-back so that makes it tremendously hard for tenant units to train. {The Joint Program Executive Officer for Chemical and Biological Defense}, Brig. Gen. Stephen Reeves, understood our need and essentially came to our rescue. We gave a briefing on our capabilities and limitations which identified the problems we have with training and resourcing our training. We explained that a training aid would assist us in maintaining our capability. Brig. Gen. Reeves took that information back to his organization more or less as a mission for the Joint Project Managers to come up with a solution.

The project to provide a simulator actually began before I reported for duty here," says Bolluyt. "But some congressional funding had been previously provided to cover about half of what we needed. So although we had a capability that was half funded we actually had no capability. This project wasn't going to come to fruition if the general didn't help us with additional funding. And he did to the tune of about $600,000.

The M93A1 Fox Training Suite contains two Fox vehicle shells with out-the-window simulation displays that operate on common virtual terrain with simulated hazard environments. This synthetic environment is completely safe yet fully capable of replicating today's vast array of chemical, biological, and radiological threats. It is equipped with a fully integrated nuclear and chemical detection, warning and communications capability with the additional capability to sample NBC contamination for future analysis. The software emulation of the threat addresses the training community's current inability to simulate the hazardous nature of the environments that must be created in order to effectively train students. The Fox Training Suite allows students to train against the threats they will likely encounter. The distributed nature of

The Short Range Thermal Imager 2000 mounted atop the Biological Integrated Detection System displays both thermal and photo quality images.

Thermal Imager Control Box and Display Monitor

PFC Crystal Spencer and PFC Lee Miller discuss the Thermal Imager with Command Sgt. Maj. Fountain.

the simulation architecture allows students to train as individual crews and in tandem with another Fox vehicle as they are doctrinally employed in real situations. Team training of this nature was not possible before the installation of the Fox Training Suite.

"The simulator provides us with a capability to train on a regular basis. Because of the JRTC schedule here, we wouldn't be able to train as frequently as we would like," explains 1st Lt. Jason Poyser, one of the 83rd Chemical Battalion Platoon Leaders. "I get to bring my Soldiers into the facility where they can experience and work through a number of different scenarios. This is an outstanding training tool.

Another significant tool the 83rd has at its disposal is something known as the Short Range Thermal Imager (SRTI-2000) mobile security system. The thermal imager is a long wavelength infrared video camera intended for use in all weather applications. It uses uncooled technology to produce high quality imagery for high security applications. This type of thermal imager will detect thermal activity in total darkness, through smoke, dust, blowing sand, fog and other obscurants. When mounted on the BIDS vehicle, it has a heighten security capability to cover a 360 degree area at numerous elevations.

During a conversation several young Soldiers had with Brig. Gen. Reeves, the Joint Program Executive Officer for Chemical and Biological Defense, they mentioned that if they could just, 'peep out the back,' of the Biological Integrated Detection System (BIDS), that would help significantly. The BIDS provides the ability for its operators to work in an overpressure environment, regardless of the environment outside the vehicle. However before the receipt of the thermal viewer, operators were essentially blinded to their external environments.

"Before the installations, there was absolutely no situational awareness of the surroundings. All we had were either FM radios or the old style radios, or we had to have someone else on the outside who could observe the vicinity. When you are in a potentially hot port of embarkation, knowing what is going on around you in extremely important," says Capt. James Scott, Commander, 7th Chemical Company, (BIDS). "Now we have a stand off ability that increases our force protection capability. The thermal imaging system allows us to do more than just peep out the back door."

The Soldiers who are called upon to do the peeping have a new found appreciation for the equipment and the training they receive while in school and once they report to their first duty station. PFC Oscar Hernandez, a 21 year old native of San Salvador who has been in the U. S. Army a little over a year explained how his Advanced Individual Training prepared him for what he would be doing at this unit.

"When I first joined, I had no knowledge of the Chemical Corps, but my recruiter and I discussed it and felt it would be a good career choice for me. I went to Fort Leonard Wood, MO, for basic training and then BIDS school," he says. "Once I got here, I didn't initially work with the BIDS, but once I transferred to the BIDS Company, I was well prepared."

PFC Derrick Smith mirrored his partner's thoughts. "The BIDS training was very good. Everything they taught me there prepared me well for what we are doing here. There were a couple of things in school that are different than here but overall, I think I was well prepared in anticipation of reporting to my unit," the Mineral, WA, native says. "In school, we didn't have a computer so we had to write everything down by hand. We did a lot of start up and shut down procedures with alternate protocol so that was the same. But in school, we didn't have this new camera. That's a big difference."

Were it not for the support of the Contractor Logistic Support (CLS) teams, keeping those cameras and other equipment running at its best capacity might not be a possibility. The CLS Teams are generally comprised of two people who are fully integrated with the BIDS or Fox units. In the event of equipment failure while deployed, their CLS representatives provide full maintenance support.

"We provide product support and engineering services; contractor logistics and maintenance; integration and support services; to meet on-site requirements," says Jim Halbert, AAI Services Corporation, Site Lead. "Our teams are considered in all the units' mobility plans and in fact, we're essentially a mobile maintenance team on wheels. We wear the same uniform, eat the same food and are housed in the same accommodations. The only thing we don't do is carry weapons."

In the second chapter of *The Art of War*, author Sun Tzu discusses what can happen when the Soldier's weapons are dull. *"Now, when your weapons are dulled, your ardor damped, your strength exhausted and your treasure spent, other chieftains will spring up to take advantage of your extremity. Then no man, however wise, will be able to avert the consequences that must ensue."* The 83rd communicated the value of keeping their weapons honed and their skills sharpened. When the warriors were asked about the secrets to their trade, their answers did not fall upon deaf ears.

Lt. Col. Michael Bolluyt expresses gratitude to Brig. Gen. Reeves and the Joint Project Managers for their support of the 83rd Chemical Battalion.

Kevin Parker, AAI services, removes and replaces an input/output board.

Charlotte Craft, AAI Field Services Technician, repairs what caused an error message on a Chemical Biological Mass Spectrometer.

FOX TIC

Toxic Industrial Chemicals

By Maj. Rodney Faust USA (Ret.) APM NBC Reconnaissance Systems

At 1000 today Sgt. Smith received a warning order to have his M93A1 Fox crew assist a Hazardous Response Team (HRT) that is conducting a sensitive site exploitation mission at an abandoned industrial facility to the West of Baghdad at 1500 hours. The HRT's mission is to enter the facility, search and collect samples to verify the existence of any hazardous toxic industrial chemicals (TIC). It is critical that these types of toxic chemicals be found and destroyed to keep the compounds from being used against U.S. forces.

From his L5 training at the U.S. Army Chemical School at Fort Leonard Wood, MO, and from information provided by the NBC Recon Systems Joint Product Manager's office, Smith knows that his M93A1 Fox was not designed to conduct a TIC sampling mission. By using safety measures and procedures developed specifically for the Fox to conduct TIC missions, he also knows that his crew can successfully accomplish this task with minimal risk.

With only five hours to prepare for this mission there are some critical steps for Smith to take to get his Fox and crew ready. There are four planning steps in conducting this type of mission: receive the mission, identify and assess the hazards, develop and implement control measures, and execute the mission.

His first action, after receiving the warning order, is to verify that the Fox's MM1 has an Environmental Computer Chip

Photo by Steve Lusher

Fox Vehicles of the 83rd Chemical Battalion, Fort Polk, LA, after returning from a Field Training Excercise. Mostly al□

installed. If his Fox does not have this chip he must alert his commander immediately and take action to acquire a chip or he will be unable to assist in the mission. The environmental chip contains a library of 112 of the most common industrial chemicals (Environmental Protection Agency classified the compounds as being the most common industrial pollutants). It requires no specialized training to use and increases the capability of the MM1. To check for the chip, Smith must remove the front panel of the MM1 and pull out the memory card. The chip should be clearly labeled and secured in line with the other chips on the memory card.

After checking the MM1, he needs to contact the HRT leader to identify and assess the hazards associated with this mission. He needs to determine what the industrial facility was used for, what the suspected agents are, what are the agent's characteristics, how the agents are used and the likelihood of a TIC incident. Using this information, he can assess the potential impacts to his crew, equipment, the operation and determine his resource requirements. If the TICs located at the facility are known, Smith can check the compound's Material Safety Data Sheet (MSDS) to gain more information on what protective measures to take. The MSDS will help him determine if his equipment offers adequate protection, the compound volatility, what first aid measures to take if exposed, what symptoms to look for, what the agent looks or smells like, what the decontamination procedures are and other names used to identify the compound. Using this information, it can be determined if the Fox can safely and effectively conduct the sampling mission or not. If the equipment cannot protect the crew from the effects of the suspected TICs, the command will be informed immediately. If the equipment can protect the crew, the mission planning will continue.

A line of Fox Vechicles that support various missions worldwide are prepared for manning at the 83rd Chemical Battalion's motor pool.

If the determination is made that the Fox can safely conduct the mission, the next step for Smith is to link up with the HRT to develop and implement controls needed to execute the mission. By developing and implementing control measures both teams will reduce risks, coordinate their efforts and make effective decisions. They will need to exchange intelligence about the mission site, develop Standard Operating Procedures, develop contingency plans, establish a link-up time line, identify additional equipment needs, identify supplies needed, develop a risk assessment and establish the chain of command. Safety concerns will have to be explained about the Fox, the danger areas for the HRT to avoid, the sampling procedures and the sampling limitations. By coordinating their preparation efforts, an effective mission plan can be developed and implemented to control measures and minimize vulnerabilities.

After developing the plan the Fox crew is briefed using the five paragraph operations order format. The crew must understand the mission, its objectives, their tasks, abort procedures, contingency plans, communications plan, decontamination plan, medical plan, equipment used, routes to and from the site and routes inside of the site. Additionally, the chain of command should be back briefed.

Once the plans have been briefed and all crew and team members understand their requirements, the next and most crucial event for them are rehearsals. Both the Fox crew and the HRT must rehearse all events associated with the mission; i.e., the site entry, site layout, sampling plan, decontamination operations, site closure and documentation procedures. Emphasis should be placed on the prioritization of events and tasks. The mission team should rehearse SOPs and develop some specific to the mission. The mission team should rehearse medical procedures and have pre-mission screening. Contingency and emergency plans should be rehearsed to include movement to and from the site.

At the conclusion of the rehearsals, Smith's crew is ready to execute the mission. His crew should know the mission risks, equipment capabilities, equipment limitations, contingency plans, decontamination requirements, communications plans, chain of custody procedures, site intelligence information, command relationship, SOPs, routes and their objectives.

By following his training and using his leadership skills, Smith can effectively lead his Fox crew to successfully accomplish this TIC mission.

Network Cen

By Candace Conwell, Chief Engineer, Joint Project Manager, Information Systems

Network Centric Warfare (NCW) is a phrase we have seen and heard for several years, and fortunately, it's not just a buzz-word. Very simply stated, NCW is superiority in achieving objectives through superior "situational awareness" and control of fully-netted assets. It is a concept that has taken hold and is beginning to be implemented in policy, programs, products, and in concepts of operations. Air, ground and maritime forces are working with coalition partners to experiment and revise network centric operations and systems. It is transforming military operations by harnessing technology for superior awareness, agility and ability to achieve desired effects with minimal penalty.

The same transformation is evident in the business community wherein competitors grab market share by having the right information at the right time. Consider Wal-Mart, a corporate giant that has established in-store data collection (to know what is being bought at any instant, as well as to analyze what sells and what doesn't in each store), and electronic re-ordering to stock shelves "just in time" rather than paying for warehouse space for items that might not sell. Thus Wal-Mart has tailored "situational awareness" and the ability to act smartly on that knowledge through its automated connectivity with its suppliers. Another example of network-enabled transformation in the commercial arena is the success of the package shipping industry. The major competitors provide their customers with reliable service by digitally tracking each shipped item, its location within the specific transport vehicle, and web-based access to view progress along the delivery route. Stockbrokers, banks, advertisers and credit card companies are just a few of the many examples of commercial enterprise using their various sensors and latest data and presentation technologies to rapidly gather, analyze, and display "actionable information" for timely and decisive decision-making by or on the part of their customers.

The Department of Defense (DoD) implementation of situational awareness harnesses similar internet and data technologies. The "Global Information Grid" or "GIG" connects sensors to systems and decision-makers, permitting almost instantaneous collaboration using a "common picture." Of course, access to data is not sufficient, and, in fact, can be overwhelming and counterproductive. Superior situational awareness is a function of the ability to acquire timely and accurate information, and present it at the right level of detail for the decision at hand, whether supporting sensitive peacetime operations or countering a threat with the best asset (weapon or countermeasure). The netting of sensors and weapons with decision-makers makes it possible to prosecute targets with the best assets available, including remotely piloted combat vehicles.

The "right picture" depends on where you are in the battlespace. The more tactical the unit, the more localized and detailed is the "picture" presented by supporting information systems. The pictures, whether "tactical" or "operational," are synchronized in that the right information is exchanged between them rapidly. A chemical alarm at a tactical unit will not or should not be transmitted to the "higher headquarters" picture until it is properly validated, but once validated (by other sensors or other reporting), the alert will become a part of the common picture, allowing decision-makers to respond appropriately. The data transmitted will include sufficient information such

tric Warfare

that commanders, medical teams and decontamination units can invoke appropriate tactics, techniques and procedures. A shared picture, while tailored specifically for each echelon of command, can display warnings and alerts to support rapid and effective decentralized decision-making. "Reach-back" support can be provided directly to hand-held computers in the field.

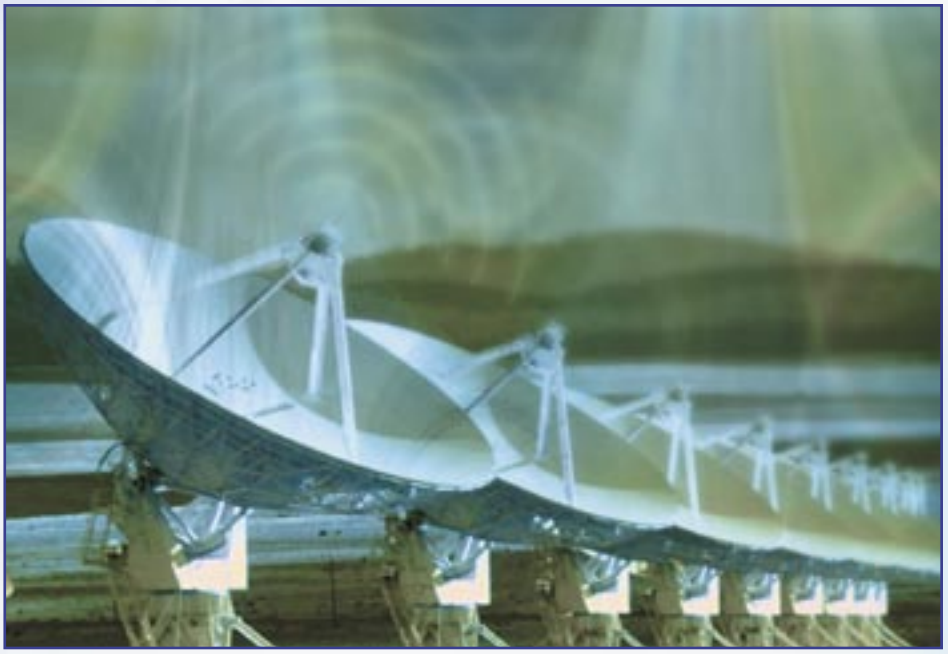
The technologies that support the internet-like connectivity of tactical, operational and strategic forces include both hardware and software, very similar, and in many cases, identical to the technologies supporting commercial enterprises. The military uses largely Commercial Off-the-Shelf (COTS) computers and routers and a mix of COTS and Government applications for managing and displaying data, imagery and even digitized sound, including voice. DoD hardware includes approved encryption for classified data.

The software that operates behind the scenes in NCW performs many functions automatically, reducing the number of tedious chores and thus permitting operators to focus on the mission. "Services-Oriented Architecture" (SOA) is the phrase used to define software modules that are designed with "discoverable" or well-defined and published interfaces such that the services can be invoked by other software services to exchange data. SOA enables sensors to publish their data schemas along with their data so that interested subscribers (operators or smart software) can discover or find the service (from a registry listing services for authorized users), read the interface description, and retrieve the data on demand. This capability to discover, subscribe and access data applies to both "raw" and "processed" data, and allows users to decide what data is right for their use.

The operational implications (bandwidth impact and operational utility) of the "publish and subscribe" capability will be refined through experimentation. The technical implementation is already underway at the Defense Information Systems Agency (DISA) and across the services. "Communities of Interest" (COI's) crossing Service boundaries are meeting and defining data schemas so that data "owned" by their communities will conform to the schema, reducing the need for translation or the likelihood of misinterpretation by a user. The Chemical, Biological, Radiological and Nuclear (CBRN) COI has established, through the Joint Program Manager, Information Systems (JPM-IS) for CBRN, a common data schema that is being used by the CBRN warning and decision support systems.

NCW is a force-multiplier in that it significantly increases our agility and effectiveness by providing timely and actionable data from multiple sources. NCW improves the ability to avoid or counter threats, including CBRN threats.

The developers of CBRN systems at JPM-IS are fully engaged in the transformation and are dedicated to ensuring that CBRN command and control systems are tied into the GIG, so that CBRN threats will be avoided through early warning or countered rapidly and decisively with appropriate tactics, techniques and procedures including timely orders to don protective equipment, activate collective protection, alert medical services, and initiate decontamination procedures.



A NEW FOCUS FOR BI

OLOGICAL DEFENSE TECHNOLOGY

By Lee B. McMillen, JPM-BDS Camber Support Contractor

Photos by Steve Lusher

On a bright, crisp April day, under a beautiful blue Air Force sky, the Department of Defense (DoD) activated the newest member of its acquisition community, the Joint Project Manager for Biological Defense (JPM-BD). The activation ceremony took place at Aberdeen Proving Grounds, Edgewood Area, MD, overlooking the waters of the Chesapeake Bay. Dignitaries, guests, leaders of industry, and members of the acquisition community looked on as the Joint Program Executive Officer for Chemical and Biological Defense, Brig. Gen. Stephen V. Reeves, brought on board the newest organizational element of the DoD team and entrusted its leadership to U.S. Air Force Col. Daniel K. Berry.

As Brig. Gen. Reeves spoke to the audience, he reminded them of the critical role that industry and members of the DoD acquisition community play as they collectively work to defend our nation and our friends and allies from the threats we face in the world. He further reminded the audience of the great technological strides that have been made to provide biological defensive capabilities to our Soldiers, Sailors, Airman, and Marines. He drew the

Brig. Gen. Reeves addresses the audience at the activation ceremony of Joint Project Manager, Biological Defense, and announces Col. Daniel K. Berry as the person in charge.

A New Focus for Biological

audience's attention to the equipment on display that many in the acquisition community had helped to develop and field. He also spoke of the growing need for technological innovation and an intensified focus on the biological threats we face. He emphasized that above all, there is a crucial need for vision and leadership to ensure DoD meets both the current and future threats we face. He stated that this crucial leadership need was going to be met by the new JPM-BD, Col. Berry.

Brig. Gen. Reeves presented Col. Berry with both a Joint Project Manager Charter and a JPM Guidon. The JPM-BD Charter, signed by Claude M. Bolton, the Army Acquisition Executive, calls for centralized management of the Biological Defense Program. It also recognizes Col. Berry as the JPM with reporting responsibility within the Army Acquisition community. The Guidon, emblazoned with the JPM-BD symbol, and bordered in purple, was symbolically passed by Brig. Gen. Reeves to Col. Berry. With this act, Brig. Gen. Reeves bestowed the responsibilities of the new organization and entrusted the mission and welfare of the Soldiers, Sailors, Airmen, and Marines he supports to the new JPM.

Col. Berry brings with him a vast experience and educational base. He holds a Bachelors of Arts in Mathematics with a minor in Chemistry and a Masters of Science in Biomathematics. He holds a Doctorate in Biomedical Engineering, and a Doctor in Medicine with board certification in both Preventive Medicine (Aerospace Medicine) and Family Practice. Berry is also Level III certified in Program Management.

As an Air Force Medical Officer and Flight Surgeon, he has traveled extensively and was deployed to Saudi Arabia, the United Arab Emirates, Bahrain, Turkey, and Somalia in support of Operations Desert Shield, Desert Storm, Restore Hope and Provide Comfort. His operational and acquisition experience includes an assignment with AWACS in Oklahoma and Saudi Arabia. He was Commander of the 325th Aerospace Medicine Squadron and Director of the Air Force Flight Surgeon Fighter Aviation Course. His next assignment was as the Chief of Aerospace Medicine and Chief of Clinical Medicine for the Air Force Space Command, Colorado Springs, Colorado. Prior to assuming this position, he was Division Chief of the Aeromedical and Medical Information System Division, then promoted to Deputy Group Commander of the Human Systems Group, Brooks Air Force Base, San Antonio, TX.

Col. Berry's mission is to develop, produce, field and sustain world-class Biological Defense technology and equipment for the Joint Services.

Defense Technology

In his remarks, Col. Berry thanked the crowd for their support and Brig. Gen. Reeves for selecting him for this leadership position. He reiterated the general's words about the priority and importance of Biological Defense and explained how it motivated him to accept this new position. Col. Berry recognized the efforts of those who were responsible for managing the acquisition programs to date and assured the community that his Joint Project Office will remain focused and committed to work with academia and industry to exploit future technologies and to provide essential products and services to support the warfighter.

Col. Berry will lead an organization that has successfully developed, produced, fielded and sustained a variety of world-class biological defense technology and equipment for the Joint Services. The JPM-BD assumes a product line that includes the Joint Portal Shield (JPS), the Joint Biological Point Detection System (JBPDS), the Biological Integrated Detection Systems (BIDS), the Dry Filter Unit (DFU), and the Joint Biological Standoff Detection System (JBSDS). The JPM-BD will also assume responsibilities for several systems under consideration for future development, such as the Joint Biological Tactical Detection System (JBTDS).

Col. Berry's role as JPM-BD is to provide focus and vision for defense of this nation against biological warfare. As he closed his remarks, Col. Berry spoke of his commitment to serve and challenged leaders of industry and members of the acquisition community to partner together to ensure that the technology, services and equipment his organization develops and fields satisfies future warfighter requirements, are delivered in the best possible time, and can be sustained in operation at the lowest lifecycle cost possible.

Brig. Gen. Reeves passes the Guidon to Col. Berry, symbolizing the passing of trust and well being from one sector to another. It also symbolizes the commitment, trust and fidelity represented by the flag of the Joint Project Manager, Biological Defense.

Fielding M31E2 BIDS Around the World

by Robyn Litle, Rich Barbera, & Kathie Ashley, JPM-BDS, Force Modernization Team

On April 24, 2002, the Commanding General of the United States Army Reserve Command (USARC), Lt. Gen. Thomas Plewes, issued an Urgent Need Statement (UNS) for the M31E2 Biological Integrated Detection System (BIDS) for the 375th Chemical Company (CM CO). The memorandum cited the heightened threat that biological warfare and terrorism poses to U.S. Forces. Prior to receipt of the memorandum, the Joint Product Manager for Biological Detection Systems (JPM-BDS), had barely begun to assemble the M31E2 BIDS for a First Quarter FY03 Operational Test and only hosted preliminary fielding discussions for the 375th CM CO. After receipt of this memorandum, the tempo of BIDS assembly, operational test planning, and fielding discussions accelerated as the September 2003 activation date for the 375th CM CO closed-in. Over the next six months, the JPM-BDS developed the M31E2 fielding the process, and three years later, this same process is used for fielding BIDS worldwide.

The Force Modernization Team (FMT) was formed by the JPM-BDS to plan and execute fielding of the M31E2 The team is responsible for writing the Materiel Fielding Plan and Materiel Fielding Agreement and hosting Fielding Integrated Working Group meetings. The FMT coordinates scheduling, shipping, de-processing and logistics support, and conducts in-briefings and out-briefings for the gaining unit.

The FMT fielded the first 35 M31E2 BIDS to the 375th CM CO from June to November 2003 at Anniston, AL, as required under the Army's UNS. Before fielding, the team assured that each platoon, consisting of 30 Soldiers, completed New Equipment Training (NET) on the M31E2 BIDS. Typically, NET consists of a 14-day course involving classroom instruction, hands-on equipment, and field training exercises. A second version of NET is a 21-day course that includes training on Force XXI Battle Command Brigade-and Below (FBCB2) system and Bio-unit leadership training. Upon completion of NET, each Soldier receives an L-4 Additional Skill Identifier. Upon completion of each class, the NET instructors solicit Soldier feedback via NET surveys. Current surveys indicate that these classes are very informative and soldiers feel well-prepared prior to assuming their biological detection mission.

From September 2004 to February 2005, the team fielded the 332d CM CO, a multi-component unit consisting of two reserve component platoons headquartered at Fayetteville, AR, and two active component platoons from Camp Carroll, Korea. The 332d CM CO's Soldiers were highly complementary of the NET and fielding. Comments back from 1st Lt. Adrein Humphreys, 3rd Platoon included the following:

"The fielding was exceptionally well-planned and executed; the pre-typed hand receipts documents not only facilitated the fielding from the JPM shop to the unit, but also facilitated the sub-hand receipts to the team leaders."

"The CONUS NET and OCONUS NET Refreshers were outstanding. They greatly enhanced our readiness to assume the bio-detection mission here on the peninsula."

From March to May 2005, the M31E2 BIDS was fielded to the 307th CM CO, a multi-component company, consisting of two reserve component platoons located in Lodi, NJ, and two active component platoons in Harvey Barracks, Kitzigen, Germany. Once again, the 307th CM CO's leadership and soldiers were highly complementary of the NET and fielding. Their comments included the following:

"The inventory and handover could not have been more simple and seamless. The organized manner in which the inventory was done allowed our eager Soldiers to jump in the systems and fire them for the first time." – Captain James A. Heaney, 307th CM CO, Commanding.

The FMT is currently conducting NET and fielding to the 31st CM CO, Fort Hood, TX. The team plans to complete this fielding by First Quarter FY06.

LESSONS LEARNED

The JPM-BDS FMT has generated and implemented a number of lessons learned from recent fieldings to the 375th, 332d, and 307th Chemical Companies. Some of these lessons learned include:

- Plan early and be flexible with the unit's schedule, maintenance support, and availability of Contractor Logistic Support. Communication is critical.
- Keep all stakeholders "in the loop." It is essential that lines of communication, trust and dialogue are established early.
- Allow time for quality control checks, prior to and after shipping the equipment. Ensure that de-processing, Preventative Maintenance Checks and Services, technical inspections and troubleshooting, are complete prior to fielding.
- Establish command and control relationships and lead responsibility for Modified Table of Organization and Equipment (MTOE) configuration, and equipment accountability to support geographically split units.
- Conduct NET then field the equipment as soon as possible. Address any gaps between NET and fielding with refresher training as part of the fielding package.
- Have Soldiers use the Technical Manuals to ensure proper start-up, shut-down, and grounding procedures are followed.
- Take the time to set-up an organized, formal hand-off exercise to set a first and lasting impression to soldiers, and the tone for a successful fielding event.

CONCLUSION

Over the past two years, the JPM-BDS FMT fielded a total of 98 M31E2 BIDS at 12 duty stations around the world. The team is proud to support this mission; it is our privilege to plan and field state-of-the-art equipment to future biological detection companies ensuring the warfighter is well equipped, well trained, and well supported.

Photo by Tom Buonaugurio

M31E2 at Operation Test, DPG, Utah

332nd CM CO Fielding, September 2004, Camp Carroll, Korea

Geographically Split Fielding of 307th CM CO, March 2005, Kitzigen Germany

Geographically Split Fielding of 307th CM CO, March 2005, Lodi, NJ

Photos by Jake Keech

307th CM CO Fielding, March 2005, Kitzegen, Germany

BIDS

BIOLOGICAL INTEGRATED DETECTION SYSTEM

MANUFACTURE

By David Whitcraft, JPM-BDS, BIDS Team Leader

Following Operation Desert Storm, an identified capability needed by the U.S. Army was the ability to detect and identify Biological Warfare Agents (BWA) on the battlefield. In 1992, the Army initiated the Biological Integrated Detection System (BIDS) program to address the Army's need for a deployable suite of detection equipment. 13 years later, a group of dedicated professionals continue this mission with the build of the M31E2, the third generation of the BIDS.

The BIDS required incorporation of multiple and complimentary BWA detection equipment on a field mobile platform. This requirement translated into a difficult integration effort, with size, weight and power as the chief areas of concern. The BIDS team solved the problem with a unique High Mobility Multipurpose Wheeled Vehicle (HMMWV) mounted shelter design and blend of commercial and military systems providing biological detection, collective protection, power distribution, environmental control and communication.

The Early Days – M31 BIDS: Commercially available detection components were chosen to meet an urgent need, but the components lacked the benefit of being designed for military use. The Edgewood Chemical Biological Center (ECBC) assembled a talented group of engineers, scientists and technicians to meet this challenge. The team tackled the problems of electromagnetic interference, shock and environmental protection of these components. The team developed mounting hardware and processes to accommodate the rather large equipment and modified the standard shelter to allow installation of this newly developed equipment. Together, the BIDS Team solved the physical interface and power requirements and developed an integration process that could meet production demands. By October 1995, the BIDS Team had assembled four Non-Developmental Item (NDI) BIDS for field testing. Following Type Classification, the BIDS Team successfully completed the assembly of five platoon sets of M31 BIDS and fielded these to the 310th Chemical Company, marking the first fielded BWA detection capability of the U.S. Army by January 1997.

M31A1 BIDS: Concurrent with the production effort on the M31, the BIDS Team was also busy with the necessary

Photo by Dave Whitcraft

Radio Installation in HMWV Cab

design work on a second generation of the BIDS, the Pre-Planned Product Improvement (P^3I) BIDS. This second-generation system required replacement of many of the NDI detection components with equipment having higher detection sensitivity and more automation. The changes required a major redesign of the physical and electrical layout. Fortunately, there were many lessons learned from the early M31 efforts that helped in the development of new mounting processes, hardware and shelter modifications. In less than two years, the BIDS Team was able to assemble seven M31E1 BIDS for two rounds of user testing in April 1997 and May 1998. Following Type Classification in November 1998, the BIDS Team completed the manufacture of five platoon sets of M31A1 BIDS and fielded these to the 7th Chemical Company by March 2000.

Photo by Dave Whitcraft

ECBC BIDS Final Assembly Area

2001, triggered the acceleration of both M31A1 and M31E2 BIDS production.

At the beginning of 2003, the future of the BIDS program brightened considerably. The Department of Army determined that due to the increased need for additional BWA detection systems, more than a dozen new BIDS companies were required and were funded through FY09. The partnership with LEAD was critical in being able to meet the increased production rates now required. By utilizing a bridge mill for drilling external shelter holes and a robot for internal holes, LEAD could modify shelters at least three times faster than ECBC could using templates and hand drilling. LEAD also has the expertise to install the onboard 10kw generator, along with the necessary wiring and power distribution system.

Upon completion, LEAD transports the modified shelter to ECBC where radios, computers and the JBPDS are tested and installed. Within days of receipt, the BIDS team is capable of mounting the shelter on an M1113 HMMWV, performing final inspection, and shipping the fully integrated M31E2 to the field.

While these systems are in the field, the BIDS Team continues to provide sustainment and technical support. When the computer systems in the M31 BIDS became outdated and unsupportable, the BIDS Team identified a replacement, designed the necessary interfacing hardware, and provided guidance to the Logistical Support Contractor on how to perform the exchange. The BIDS Team tackled the same hardware and power issues created by the obsolescence of computer systems in the first Company of M31A1 BIDS. The latter effort was complicated by the concurrent job of installing a situational awareness camera on the M31A1. The computer upgrade and situational awareness camera installation efforts are the latest in a series of improvements that the BIDS team has undertaken to ensure the M31 fleet is supported well into the future.

Over the course of the past 13 years, the BIDS Team has prepared test systems for eight different user tests, assembled more than 230 BIDS, for six fielded BIDS Chemical Companies, and provided the technical assistance and upgrades needed to support those systems in the field. The schedule for delivering materials, sub-components, components and assembled systems has been demanding; but the timely delivery of the BIDS was made possible through the hard work, cooperation, and perseverance of the LEAD Team, the BIDS vendor network and the ECBC BIDS Team. The strong teaming effort has made a clear difference in our nation's shield against Biological Warfare.

Photos by Don Bitner

Robot Drilling Holes in Shelter Interior

Cable Raceway Installation Inside Shelter

Bridge Mill Cutting Exterior Holes on Shelter Exterior

Photo by Dave Whitcraft

BIDS Bridge Mill

The Recent Past - Four years ago, funding was provided to the BIDS Team to complete five platoon sets of M31A1 BIDS for the 13th Chemical Company and began the manufacture of five platoon sets of the last generation of BIDS, the M31E2 for the 375th Chemical Company. This third-generation system required replacement of all the biological detection components of the M31A1 BIDS with the Joint Biological Point Detection System (JBPDS). In order to meet the demanding production and fielding schedule, the BIDS Team began a partnership with Letterkenny Army Depot (LEAD) in Chambersburg, PA.

The BIDS team and LEAD developed a plan with serial production at the two sites to maximize both production throughput and quality. Utilizing templates and other technical information provided by the BIDS Team, LEAD developed a semi-automated process for performing the shelter modifications. The partnership and improved processes would prove invaluable as the events of September 11,

Biological Detection Decision Models

By Patrick L. Berry, Joint Project Manager-Biological Defense (JPM-BD)

Biological detection offers a unique set of challenges, most notably; the requirement to reliably detect very low concentrations of diverse agents that physically and bio-chemically resemble benign materials, which occur naturally in the environment. Single detection technologies suitable for automated field use often lack the specificity required to meet this challenge. Therefore, current approaches tend to exploit detectors based on multiple technologies, as well as fixed detector arrays.

The availability of chemical and biological (CB) information systems, such as the Joint Warning and Reporting Network (JWARN), within the battlefield network-centric architecture, permits expansion of this approach to include all biological detection assets within an Area of Interest (AOI). However, effective use of these data requires a coherent method, or decision model, for integrating a priori knowledge concerning the battlefield environment with results from multiple types of detectors, as indicated in **Figure 1**. The resulting decision from the detection model is the probability that a Biological Warfare (BW) attack has occurred, given all available information.

This result can then be used to advise the commander, evaluate operational effects, prioritize sample analysis and target medical surveillance and countermeasures. Use of the decision model requires methods to characterize detector performance and to account for the geographic dispersion and timing of detector results.

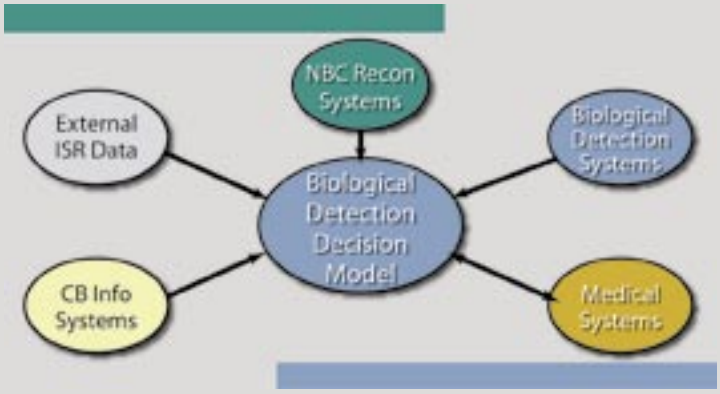
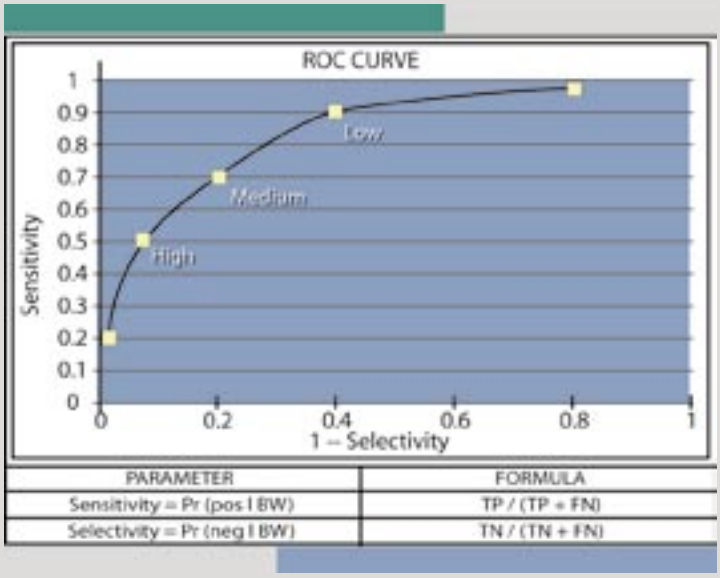


Figure 1 - Biological Detection Decision Model

Detector performance is best characterized by Receiver Operating Characteristic (ROC) curves, as described by Carrano[1]. A typical detector ROC curve is shown in **Figure 2**. Sensitivity is defined as the probability of a positive result when a BW agent is present, or Pr (pos | BW), and Selectivity is defined as the probability of a negative result when no BW agent is present, or Pr (neg | ~BW). The formulas for calculating these parameters from experimental data are shown in **Figure 2** and are based on the relative numbers of true positives (TP), true negatives (TN), false positives (FP), and false negatives (FN). Since these parameters will vary for different agents, response times, and background conditions; a given type of detector requires a family of ROC curves to fully characterize its performance.



PARAMETER	FORMULA
Sensitivity = Pr (pos I BW)	TP / (TP + FN)
Selectivity = Pr (neg I BW)	TN / (TN + FN)

Figure 2 – Typical Detector ROC Curve

The labeled points on the ROC curve in **Figure 2** (e.g., High, Medium and Low) represent detector cut-off values or threshold levels. The Low threshold has the highest Sensitivity, but the lowest Selectivity. Conversely, the High threshold has the highest Selectivity, but the lowest Sensitivity. Generally, materiel developers select a threshold to achieve an acceptable trade-off between Sensitivity and Selectivity which satisfies specific end-item performance requirements.

Figure 3 depicts an arbitrary array of biological detectors in the battle space. This array includes two different types of detectors; one having high Sensitivity (shown in red) and the other having high Selectivity (shown in yellow). The orange circle indicates which detector alarmed first and thus initiated the detection event.

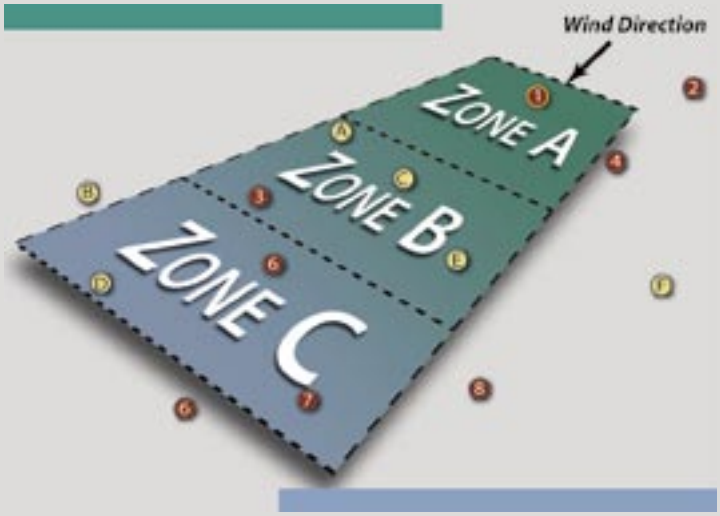


Figure 3 - Detector Array

[1] *Carrano, Lt. Col. John C., Chemical and Biological Sensor Standards Study, Defense Advanced Research Projects Agency, 2004, http://www.darpa.mil/mto/people/pms/pdfs/CBS3Final Report.pdf*

Various heuristic methods can be employed to account for geographic dispersion of detector results. As an example, the overlay shown by dashed lines in **Figure 3** defines an AOI for this particular event based on wind speed and direction. The overlay is indexed on the initial alarm location and is oriented normal to the downwind azimuth. The AOI is subdivided into three zones (A, B and C) spaced successively farther apart in the downwind direction. The BW cloud is assumed to be present at all detector locations in Zone A, but its probability of reaching locations in Zone B or C is less than one, due to transport and diffusion variability. Any detectors lying outside the AOI are not considered in the computations. Although all detector locations are assumed to be fixed in this example, there is no requirement that this be the case.

The other key aspect that must be considered in assessing detector results is the time at which a result occurs. Only those results that occur within a reasonable time frame, based on location and meteorological conditions, are used in the computations. One simplistic approach is to assign a time window to each zone shown in **Figure 3**, based on the time required for the cloud to cross the immediately prior upwind zone, plus or minus 50 percent. Detailed transport and diffusion models, such as HPAC or VLSTRACK, can be used to provide more specific estimates of expected cloud conditions as a function of time and space coordinates.

Figure 4 depicts a simple decision model based on a Bayesian network or influence diagram. A Bayesian network allows one to use variables whose values can be observed to draw inferences about variables that cannot be specified (e.g., state variables). In a Bayesian network, the nodes represent either observed or state variables, and the arcs represent the causal relationship between variables. Each node is assigned a conditional probability for each set of states of its parent nodes. Statistical inference, based on Bayes Rule, is used to estimate the probability of a state variable given all observations (e.g., evidence). This process is referred to as querying or evaluating a node. In **Figure 4**, observed variables are shown in blue and state variables are shown in green.

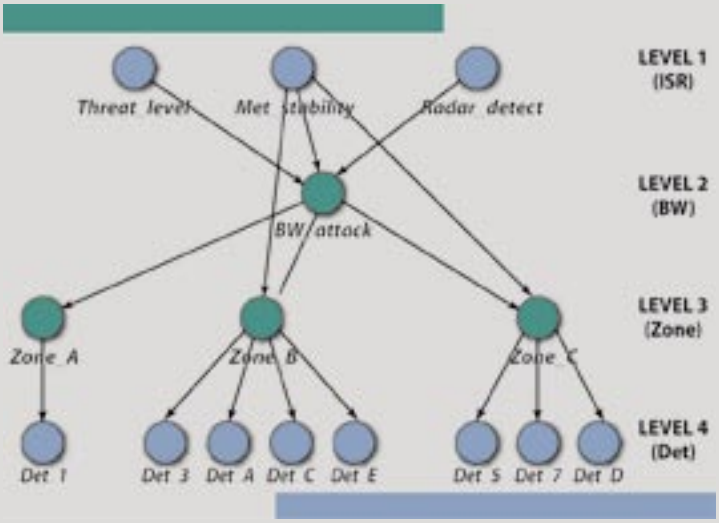


Figure 4 - Bayesian Belief Network

As indicated by **Figure 4**, a number of external intelligence, surveillance and reconnaissance (ISR) factors (Level 1) are used to estimate the probability of a BW attack (Level 2). When a BW attack occurs, the threat cloud is transported downwind and reaches various areas or zones (Level 3) with different probabilities based on distance and atmospheric stability. The detectors (Level 4) then respond based on the presence or absence of the cloud and their ROC curve parameters. In this model, the primary state variable is "BW_attack," which indicates whether or not a BW attack has occurred.

Commander discusses battlefield reports from simulated attack

The "BW_attack" node can be queried to compute the probability of a BW attack given the observed parameters. Prior to a detection event, when all detector results are negative, the probability of a BW attack is 0.02 or 2 percent for given states of the Level 1 parameters. If "Det_1" (see **Figure 3**) then alarms, the BW attack probability becomes 0.53. If "Det_3" and "Det_A" subsequently alarm as well, the probability that a BW attack has occurred increases to 0.96. One should keep in mind that these results also depend on the specific conditional probabilities assigned to the network, as well as the observed values of the Level 1 nodes. However, they clearly indicate the increased confidence provided by multiple detections, even when the perceived BW threat is relatively low. This example also indicates that the Bayesian network can be re-evaluated, as additional information becomes available, until the probability of a BW attack reaches some critical decision value.

The decision model described above can be easily and dynamically updated to reflect changes in the battlefield conditions. The key elements of the model are ROC curves to characterize detector performance, methods to account for spatial and temporal variation of detector results, and a Bayesian network to integrate these results with external data and determine the overall probability of a BW attack. Use of this approach requires that each detector periodically transmit a result (positive or negative) with its associated ROC curve Sensitivity and Specificity, based on the detector threshold and background conditions. Each detector must also provide its location (GPS coordinates) and associated wind speed and direction, if available. The decision model would be embedded in the CB information system which would in turn provide the BW attack probability via appropriate NBC messages.

This article highlights the benefits of a coherent biological detection decision model and the concept of operations for its use, and illustrates how such might be employed to define the minimum data set required from a biological detector to achieve joint service and coalition interoperability. The specifics provided herein illustrate one possible technical solution, but additional detail and refinement are needed for actual field implementation. Areas requiring further investigation are the structure of the decision model itself, identification of all inputs and outputs, development of methods to account for spatial and temporal dispersion of detector results, and determination of dependencies among different types of point and stand-off detectors.

Biological Standoff Detection System Development

By John Strawbridge, JPM-BD, JBSDS Team

The operational use of a biological standoff detection system had its genesis in Operation Desert Shield/Storm with the potential large scale use of biological weapons by Iraq in the early 1990's. Biological point detectors, which typically require upwards of 20 minutes to alarm on a biological attack, satisfy the current military doctrine of "detect to treat." With this doctrine, large numbers of personnel may be contaminated prior to the implementation of protective measures and will require post attack medical treatment to restore them to health. Use of a biological standoff detector enables a threat cloud to be detected at a significant standoff range and provides the requisite advance warning to implement protective measures before large numbers of personnel can be contaminated. Accordingly, Biological Standoff Detection Systems could satisfy the military doctrine of "detect to protect," mapping and tracking the paths of otherwise invisible aerosol clouds, and allow field commanders to cue biological point detectors to allow faster presumptive identification and contamination avoidance. This capability, which would greatly reduce the medical logistics burden after a biological agent attack, has made biological standoff detection the number one chemical/biological desired capability by the combatant commanders.

During Desert Shield/Storm, Los Alamos National Laboratory in conjunction with the U.S. Army, demonstrated an aircraft mounted Light Detection And Ranging (LIDAR) system that utilized a one micrometer wavelength laser to detect aerial releases of biological simulants out to 45 kilometers (km). A LIDAR functions similarly to a RAdio Detection And Ranging (RADAR), but uses micrometer wavelength laser light instead of radio waves to detect invisible micrometer size particles (typical of biological agent particles) in the air. After Desert Shield/Storm an Army Operational Requirements Document (ORD) was approved for a UH-60 helicopter mounted biological standoff detection system that would detect man made releases of aerosols out to 30 km.

In 1993, the U.S. Army's then Chemical Biological Defense Command partnered with Los Alamos National Laboratory to design, test, and field a Long Range Biological Standoff Detection System (LR-BSDS) as an interim biological standoff detection system that would meet the threshold requirements of the ORD. The XM94 LR-BSDS was type classified limited procurement in 1995. Three XM94 systems were fielded to the Army as an initial operational capability in June 1997. The XM94 LIDAR used a one micrometer wavelength laser to generically detect aerosol clouds by concentration and cloud geometry that resembled long line source releases of biological agent clouds.

Photo by John Strawbridge

XM94 mounted in UH-60

A subsequent development program was started by the Army in 1995 to design and test an improved version of the XM94. The improved system would require only one operator, extend stand-off detection to a range of 50 kms, and be eye safe. This program was terminated in 2000 due to changing threat

XM94E1 Mounted in UH-60

conditions and the unavailability of UH-60's to carry the system.

In 1995, the Army started development of a High Mobility Multipurpose Wheeled Vehicle (HMMWV) mounted Short Range – Biological Standoff Detection System (SR-BSDS) that provided cloud detection out to five km and discriminated biological aerosol clouds from non biological aerosol clouds out to one km. This LIDAR system used both IR wavelengths to generically detect aerosol clouds and ultraviolet (UV) wavelengths to discriminate biological from non-biological clouds using Laser Induced Florescence. The SR-BSDS was selected by the Joint Biological Remote Early Warning System (JBREWS) Advanced Concept Technology Demonstration (ACTD) in 1998. The JBREWS ACTD demonstrated the technical performance of the SR-BSDS and developed the tactics, techniques and procedures for deploying the system.

A Joint Operational Requirements Document (JORD) for a Joint Biological Standoff Detection System (JBSDS) was written and approved by the Army and Air Force in 2002, based largely on the performance of the SR-BSDS in the JBREWS ACTD. The Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) started a development program in 2002 to design, build, and test a JBSDS that met the Increment 1 JORD requirements. The JPEO evaluated two LIDAR systems as candidates for the JBSDS Increment 1. After extensive technical testing of the two candidates, a design manufactured by Science and Engineering Services Inc., was selected in 2004 to proceed into Low Rate Initial Production (LRIP)

The JBSDS Increment 1 is currently undergoing Production Verification Testing at multiple test sites under the management of the Joint Project Manager for Biological Defense (JPM-BD).

The Multiservice Operational Test and Evaluation (MOT&E) will be conducted at Dugway Proving Ground, UT in Fourth Quarter FY05 and First Quarter FY06. Upon successful completion of MOT&E, the JPM-BD will seek a full rate production decision for 18 units. Army first unit equipped (FUE) is scheduled for Second Quarter FY06 and the Air Force FUE is scheduled for Second Quarter FY07.

The JPM-BD is currently starting development of the next generation JBSDS. The Increment 2 JBSDS will be a smaller, more sensitive version of the Increment 1 JBSDS that will be used by all four Services. A Capabilities Development Document (CDD) is being written for the Increment 2 JBSDS by the Joint Requirements Office. It is envisioned the Increment 2 JBSDS will use multiple technologies to increase sensitivity, lower false alarm rates, and reduce size. The JPM-BD is currently assessing potential technologies through a Technology Demonstration at Dugway Proving Ground in Third Quarter FY05 and a Technology Readiness Assessment scheduled for FY06.

As RADAR revolutionized defense against aircraft attacks, biological standoff detection systems will do the same against the threat of an incoming biological agent cloud. Emerging systems such as the JBSDS will provide a significant operational advantage against these invisible attacks by providing advanced warning and tracking of the incoming threat; thereby, allowing our warfighters time to get into protective posture before being exposed.

Photo by John Strawbridge

SR-BSDS Mounted on a HMMWV

Photo by Steve Lusher

XM104 JBSDS Increment 1 Mounted in HMMWV

WSLAT

What's That?

By Mr. Chee Chan JPM NBC CA and Dr. Douglas Andersen WDTC, DPG

In July 2002, the Director, Operational Test and Evaluation (DOT&E) directed that a Whole System Live Agent Test (WSLAT) capability was needed to characterize performance of the Joint Biological Point Detection System (JBPDS) to determine whether the JBPDS is operationally effective prior to authorization of full-rate production.

The Joint Project Manager for Nuclear, Biological and Chemical Contamination Avoidance (JPM NBC CA), Aberdeen Proving Ground (APG), was designated to lead the WSLAT effort in August 2004. The WSLAT team was established in October 2004 to execute the WSLAT program. The WSLAT team consists of JPM NBC CA personnel (WSLAT-East) and West Desert Test Center (WDTC), Dugway Proving Ground (DPG) personnel (WSLAT-West).

The JPM NBC CA developed a cost- and time-effective strategy to accomplish the necessary testing to support the full-rate production decision of the JBPDS. The strategy utilizes existing test infrastructure and new methodology at WDTC, DPG. The approach includes the use of three facilities [the Bio-Safety Level 3 (BL-3) Containment Aerosol Chamber (CAC); the BL-1 Aerosol Simulant Exposure Chamber (ASEC); and, the BL-1 Ambient Breeze tunnel (ABT)] at WDTC, DPG. Testing will include threat-representative live agents and simulants, and production-representative Man Portable (MP) JBPDSs. Two types of MP JBPDSs will be used for the WSLAT program; the MP JBPDS (known as "as-built" JBPDS), and a slightly modified configuration to allow physical placement within the BL-3 chamber (known as the "strung-out" JBPDS). These tests will permit the development of:

(a) Correlations in performance between the strung-out MP JBPDS and the as-built MP JBPDS;
(b) Correlations in system response between threat-representative live agents and simulants. (From this, JBPDS detection and identification performance for live agents in an operational setting may then be inferred through the correlations that have been developed); and
(c) Correlations between the three test facilities (CAC, ASEC, and ABT).

The WSLAT strategy employs an approach wherein simulants are developed and characterized to ensure they are adequate in terms of their representation of threat agents, and a determination of correlations is made at process endpoints within the JBPDS. The simulant characterization effort is then followed by a systematic test and evaluation process with simulants and live agents using JBPDS components as well as the entire JBPDS. Four representative live agents will be chosen (one from each class of biological agent): spore bacteria, vegetative bacteria, virus, and toxin of varying particle sizes and concentrations. Tests will be conducted in the three facilities according to the strategy depicted in the diagram below.

Four major events are needed to accomplish the WSLAT: "recipe" card standardization, modeling and simulation, test methodology development and record test.

"Recipe card" standardization. The goals of the "recipe card" standardization are to standardize the production of antigens and antibodies used by the community in chamber testing and in the field. The WSLAT will closely coordinate its efforts in this area with the Critical Reagent Program Office at APG to leverage available resources and ensure exchange of information.

Modeling & Simulation. Data generated from DPG chamber tests will be used to develop and validate a model that will support future JBPDS evaluations. The model generated will be validated, verified, and accredited by U.S. Army Test and Evaluation Command (ATEC).

Test methodology development. Prior to the start of record test, standardized test methods for the CAC, ASEC and ABT will be developed. Test methods to be developed include dissemination procedures and instrumentation requirements to achieve the required test concentrations and particle sizes for each

Photo by A. Vogel

WSLAT Team West. Left to right: Wing Tsang, Tammy Lopez, Russell Bartholomew, Diane Walker, Douglas Andersen, Aaron Thomas, Irene Parrish (not pictured)

of the agents, simulants and interferents. Wherever possible, identical procedures and instrumentation will be used in the CAC, ASEC and ABT.

Record test. Testing is to be conducted in the CAC, ASEC and ABT. The WSLAT team envisions common reagent preparation, a common referee system and dissemination methodology throughout.

CAC – The CAC is a BL-3 containment facility with the approval to aerosolize live and irradiated pathogenic organisms, live and irradiated agent-like organisms (ALOs), and existing simulants. Because the physical dimensions of the CAC prohibit testing of the MP JBPDS in its 'as-built' physical configuration, the MP JBPDS will be 'strung-out' whereby the as-built Biological Aerosol Warning Sensor and collector will be extracted from the BBSU and reconfigured within the CAC while still maintaining the same functions and connections as the "as-built" system. Testing within the CAC will be used to develop correlations between pathogenic organisms/irradiated pathogenic organisms, ALOs/irradiated ALOs, and active/inactive toxin. Spore simulant testing will also be conducted in the CAC as well as the other facilities to allow correlation to previous JBPDS test data. In addition, CAC data will also be used to characterize the sample integrity effects of the various JBPDS LRUs on overall system performance.

ASEC – The ASEC is a clean laboratory environment that can be used to test against irradiated pathogenic organisms, irradiated ALO organisms, inactive toxins and simulants. Both the 'strung-out' and the 'as-built' configured JBPDSs will be tested in the ASEC. Beginning with the spore class, correlations will be made between the CAC tested 'strung-out' system and the 'as-built' system performance side-by-side in the ASEC. ASEC testing is envisioned only for the spore class. If ASEC spore testing demonstrates similar behavior between the indoor (CAC) and outdoor (ABT) environments, then the ASEC testing for the vegetative, virus and toxin classes will be a root-cause analysis option.

ABT – The ABT is an outdoor environment whereby irradiated ALOs and simulants can be tested. Additionally, interferents can be introduced in a controlled field environment. The 'strung-out' and the 'as-built' configured JBPDS will be tested for performance side-by-side against irradiated ALOs, inactive toxin and simulants. Four types of interferents will be used during the ABT test. They are: diesel exhaust, signal smoke, road dust and burning vegetation.

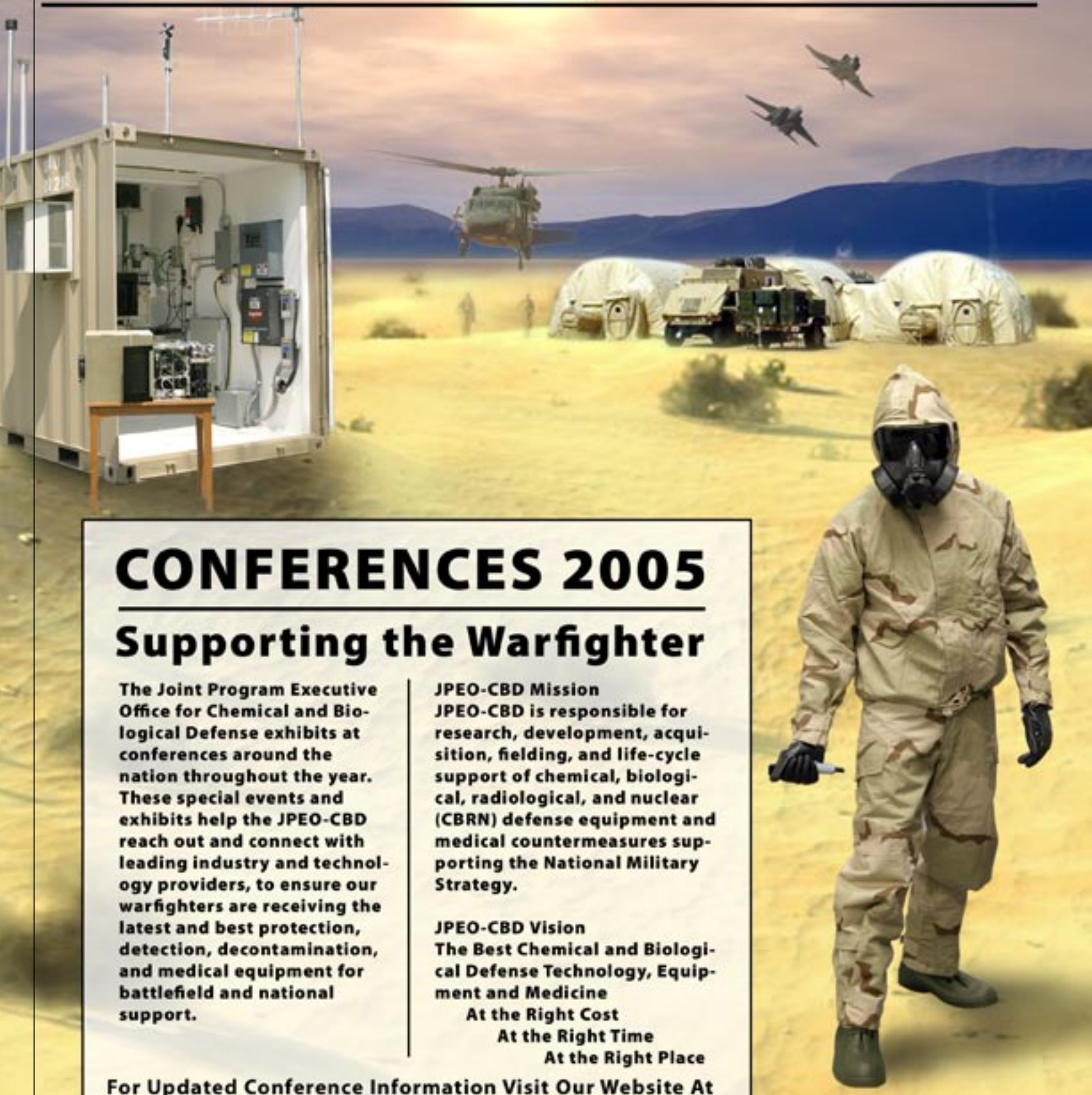
Chamber Design. The strategy also includes concurrent design of a chamber to test the as-built system if the strung-out system configuration does not perform equally to the as-built JBPDS, as determined by correlation studies. System specifications for a BL-3 facility of sufficient capability to test two MP JBPDS units side-by-side are being developed. These specifications will be part of a contract to be awarded before the end of FY05. The JPM NBC CA team is using a contract mechanism already in place within the Edgewood Chemical Biological Center to maximize competition while streamlining the time needed to award the contract.

To date, the WSLAT team has aggressively coordinated for and received support from various organizations that will guide the WSLAT effort to success. Representatives from DOT&E, Deputy Under Secretary of the Army (Operations Research), Joint Program Executive Office for Chemical and Biological Defense, ATEC, Joint Project Manager for Biological Defense, U.S. Army Developmental Test Command, U.S. Air Force Operational Test and Evaluation Center, U.S. Marine Corps Operational Test and Evaluation Activity, U.S. Navy Operational Test and Evaluation Force and the U.S. Army Chemical School have signed on to support the WSLAT effort. Since the establishment of the WSLAT team in October 2004, the joint concept test plan, the methodology plan development, the chamber/instrumentation preparation, and the antigen/ antibody work has already begun. The WSLAT "recipe standardization" methodology effort will continue through FY06. The record test and modeling and simulation is scheduled to be completed in FY07 prior to the initiation of the JBPDS Multi-Service Operation Test and Evaluation.

Photo by Kate Ong

WSLAT Team East. Front: Franz Schulzke, Roger Davis, Suzanne Kracke, Chee Chan, Kakoli Niyogi, Lisa Caudill, Elaine Neary. Back: Mark Myers, Derek Harberts, Ken Dahmen

Joint Program Executive Office for Chemical and Biological Defense



CONFERENCES 2005

Supporting the Warfighter

The Joint Program Executive Office for Chemical and Biological Defense exhibits at conferences around the nation throughout the year. These special events and exhibits help the JPEO-CBD reach out and connect with leading industry and technology providers, to ensure our warfighters are receiving the latest and best protection, detection, decontamination, and medical equipment for battlefield and national support.

JPEO-CBD Mission
JPEO-CBD is responsible for research, development, acquisition, fielding, and life-cycle support of chemical, biological, radiological, and nuclear (CBRN) defense equipment and medical countermeasures supporting the National Military Strategy.

JPEO-CBD Vision
The Best Chemical and Biological Defense Technology, Equipment and Medicine
At the Right Cost
At the Right Time
At the Right Place

For Updated Conference Information Visit Our Website At
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‘The Reason for Our Success is Our People.’

Fair Winds and Following Seas to Cdr. Steven G. Bertolaccini who retired from active duty at a ceremony held in his honor at the Seabee Memorial Arlington National Cemetery, Arlington, VA. Capt. Robert Raines, Civil Engineer Corps, U.S. Navy Commander, Southern Division, NAVFAC, Charleston, SC, presents Cdr. Bertolaccini’s Shadow Box, signifying valor, honor and glory, as well as hosting a list of all previous duty stations and the United States Ensign.

Col. Thomas Spoehr, G-8 Director of Materiel, presents Maj. James Choung, Deputy, Systems Support Directorate, Joint Program Executive Office for Chemical and Biological Defense, with a traditional coin for coordinating the Pentagon and Capitol Hill equipment demonstration June 9th and 10th.

Col. Camille Nichols, Joint Project Manager, Guardian, congratulates Mr. Jerry Aveta, on the occasion of his retirement after 30 years of service. He was also presented the Superior Civilian Service Award at a ceremony held in his honor May 27, 2005

Master Sgt. James Kowalsky, an Intelligence Analyst speaks with Mr. Robert Lyons from the Joint Project Manager, Nuclear Biological Chemical, Contamination Avoidance during the Joint Program Executive Office for Chemical and Biological Defense equipment demonstration.

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